I Claim:

1) A system for solenoid control to achieve low impact landing with latching under varying conditions, comprising:

a) sense means, for obtaining parameters indicating the state of a controlled solenoid;

b) path memory means, for retrieval of information descriptive of paths in a state space, said paths approximating possible paths in a state space of said controlled solenoid, including a multiplicity of paths that lead to low impact landings with latching under a corresponding multiplicity of operating conditions;

c) error detection means, for comparing said information from said path memory means with said parameters from said sense means, thereby defining an error between said state of said controlled solenoid and a state in said state space corresponding to one of said multiplicity of paths that lead to low impact landings with latching; and

d) drive control means, setting an output signal in accordance with information from said sense means, said path memory means, and said error detection means; whereby the dynamically changing state of said controlled solenoid is caused to approach a path among said multiplicity of paths that lead to low impact landings with latching.

2) The system of Claim 1, wherein said parameters from said sense means are transformable into an indicator of position, an indicator of velocity, and an indicator of electromagnetic state;

3) The system of Claim 2, wherein said indicator of velocity is a difference between two positions.

4) The system of Claim 2, wherein said indicator of electromagnetic state is flux linkage.

5) The system of Claim 2, wherein said indicator of electromagnetic state is current.

6) The system of Claim 1, wherein said output signal from said drive control means is a voltage.

7) The system of Claim 1, wherein said parameters from said sense means include a measured current, a voltage, and a flux linkage inferred from integration of an inductive voltage related to said voltage and said measured current.

8) The system of Claim 7, wherein said voltage is inferred from said setting of said output signal by said drive control means.

9) The system of Claim 7, wherein said voltage is inferred from a pulse width modulation duty cycle and knowledge of a supply voltage.

10) The system of Claim 7, wherein said current and said flux linkage together indicate position of said solenoid.

11) The system of Claim 10, wherein differences in said position at different times provide a measure of velocity, whereby the state of said solenoid is defined by said position, said measure of velocity, and said flux linkage.

12) The system of Claim 1, wherein:

a) said one of said multiplicity of paths that lead to low impact landings with latching is associated with a particular operating condition from among said multiplicity of operating conditions;

b) said particular operating condition is a mechanical energy of said solenoid;

c) said particular operating condition is associated with a path number;

d) said drive control means includes means to quantify systematic drift in said path number; and

e) said systematic drift indicates an error in said information from said path memory means that is accessed by said error detection means for said comparing and said defining an error.

13) The system of Claim 12, wherein said error in said information is used to correct said information descriptive of paths retrieved by said path memory means.

14) The system of Claim 12, wherein said error in said information is used to select and retrieve different information descriptive of paths from said path memory means; whereby said different information is selected to better match predictive path perturbations which are affecting approach to said low impact landing which are distinct from said operating conditions, and which describe a present mechanical energy arising from past events.

15) A method for solenoid control to achieve low-impact landing, including steps of:

a) testing, wherein a test system, having response characteristics like those of the solenoid to be controlled, is caused to execute trajectories, including trajectories with differing initial energies that achieve low-impact landing, said low-impact landing including

latching and no speed of impact or of bounce-and-impact exceeding a prescribed maximum speed;

a) path function calibration, wherein parameters of path functions are adjusted so that said path functions describe said trajectories that achieve said low-impact landing;

b) calibration programming, wherein a real-time solenoid hardware controller is programmed to recall said path function calibration;

c) response comparison programming, wherein said controller is further programmed to make a comparison between a measured solenoid response and at least one of said trajectories described by said path functions; and

d) drive control programming, responsive to said comparison by controlling an electrical drive signal as part of the actuation of said measured solenoid.

16) The method of Claim 15, wherein said test system is a mathematical simulation generating simulated response characteristics equivalent to said response characteristics like those of the solenoid to be controlled.

17) The method of Claim 15, wherein said test system is a solenoid with instrumentation to measure said trajectories.

18) The method of Claim 15, wherein said path functions define points in a multi-dimensional space of state space variables.

19) The method of Claim 18, wherein the dimensions of said space are transformable into the dimensions of position, velocity, and flux linkage.

20) The method of Claim 18, wherein said dimensions are a measured position, a difference between measured positions, and a cumulative total of inductive voltages.

21) The method of Claim 20, wherein said inductive voltages are voltages measured from a sense coil;

22) The method of Claim 20, wherein said inductive voltages are computed from an applied voltage, a current, and a resistive voltage that is a function of said current.

23) The method of Claim 22, wherein said applied voltage is computed from supply voltage information and from the duty cycle of a pulse width modulator.

24) The method of Claim 22, wherein said current is measured using a sense resistor.

25) The method of Claim 22, wherein said resistive voltage function is said current multiplied by a resistance.

26) The method of Claim 15, wherein said drive control programming includes determination of a flux linkage projected into the future relative to a measurement time of said measured solenoid response.

27) The method of Claim 15, wherein said drive control programming includes determination of a voltage to be generated in a future period of time relative to a measurement time of said measured solenoid response.

28) An adaptive system for solenoid control to achieve low impact landing with latching, with variable initial energy, and with variable path drift, comprising:

a) sense means, for obtaining parameters indicating the state of a controlled solenoid, said state comprising a magnetic state;

b) path memory means, for retrieval of predetermined information descriptive of possible low-impact landing paths in the state space of said controlled solenoid said information comprising information descriptive of magnetic state;

c) a variable path number, associated with said information from said path memory means, differentiating said landing paths with respect to initial energy;

d) a variable path drift parameter, associated with said information from said path memory means, differentiating said landing paths with respect to pattern of drift along among said landing paths;

e) path number determination means, for comparing said information from said path memory means with said parameters from said sense means, thereby establishing a defined path number associated with said parameters from said sense means;

f) loss parameter setting means, setting said variable path drift parameter;

g) magnetic error evaluation means, determining an error between said magnetic state of said controlled solenoid as obtained by said sense means and a magnetic state from said path memory means, corresponding to said defined path and said path drift parameter; and

h) drive control means, responsive to said magnetic error evaluation means and setting an output signal controlling the flow of electrical energy into said controlled solenoid.

29) The system of Claim 28, wherein said parameters indicating the state, obtained by said sense means, further comprise a position parameter, a velocity parameter, and a flux linkage parameter.

30) The system of Claim 28, wherein said parameters indicating the state, obtained by said sense means, further comprise a position parameter, a velocity parameter, and an electric current parameter.

31) The system of Claim 28, wherein the content of said path memory means is predetermined by dynamic simulations.

32) The system of Claim 28, wherein said information retrieved by said path memory means is predetermined by instrumented testing of a solenoid.

33) The system of Claim 28, wherein said loss parameter setting means uses predetermined information concerning the expected solenoid load, prior to an actuation cycle of said solenoid.

34) The system of Claim 28, wherein said loss parameter setting means uses a path number drift parameter from a previous actuation cycle of said solenoid.

35) The system of Claim 28, wherein said loss parameter setting means uses a path number drift parameter from a current, ongoing actuation cycle of said solenoid.

36) A system for control of nonlinear dynamic systems of at least third order, for reaching a target destination in a state space from any among multiple entry points, comprising:

a) sense means, for obtaining parameters indicating the state of a controlled system;

b) path memory means, for retrieval of information descriptive of possible paths reaching a target destination in said state space of said controlled system;

c) a variable path number, associated with said information from said path memory means, differentiating said paths with respect to a measure of distance in said state space from said target destination;

d) a variable path perturbation parameter, selecting from an array of path perturbations associated with said path memory means;

e) path number identification means, for comparing said information from said path memory means with said parameters from said sense means, thereby defining a nearest

path number associated with said parameters from said sense means and further associated with a selected value of said path perturbation parameter;

f) error evaluation means, defining a scalar error based on said nearest path number and on said state indicated by said parameters obtained by said sense means;

g) drive control means, responsive to said scalar error by controlling a variable drive input to said controlled system, thereby reducing said scalar error;

h) path drift evaluation means, quantifying a systematic drift from said nearest path number; and,

i) drift reduction means, responsive to said quantifying by said path drift evaluation means by setting said path perturbation parameter to a value that reduces said systematic drift.

37) The system of Claim 36, wherein said measure of distance is a measure of energy change required to reach said target destination from an entry point associated with a specified value of said variable path number.